

National Transportation Safety Board

Office of Research and Engineering

Washington, DC 20594



ERA22LA148

AIRCRAFT PERFORMANCE STUDY - ATTACHMENTS

February 29, 2024

ATTACHMENT 1: CESSNA 525B THREE-VIEW DRAWING

AIRPLANE THREE VIEW

A37497

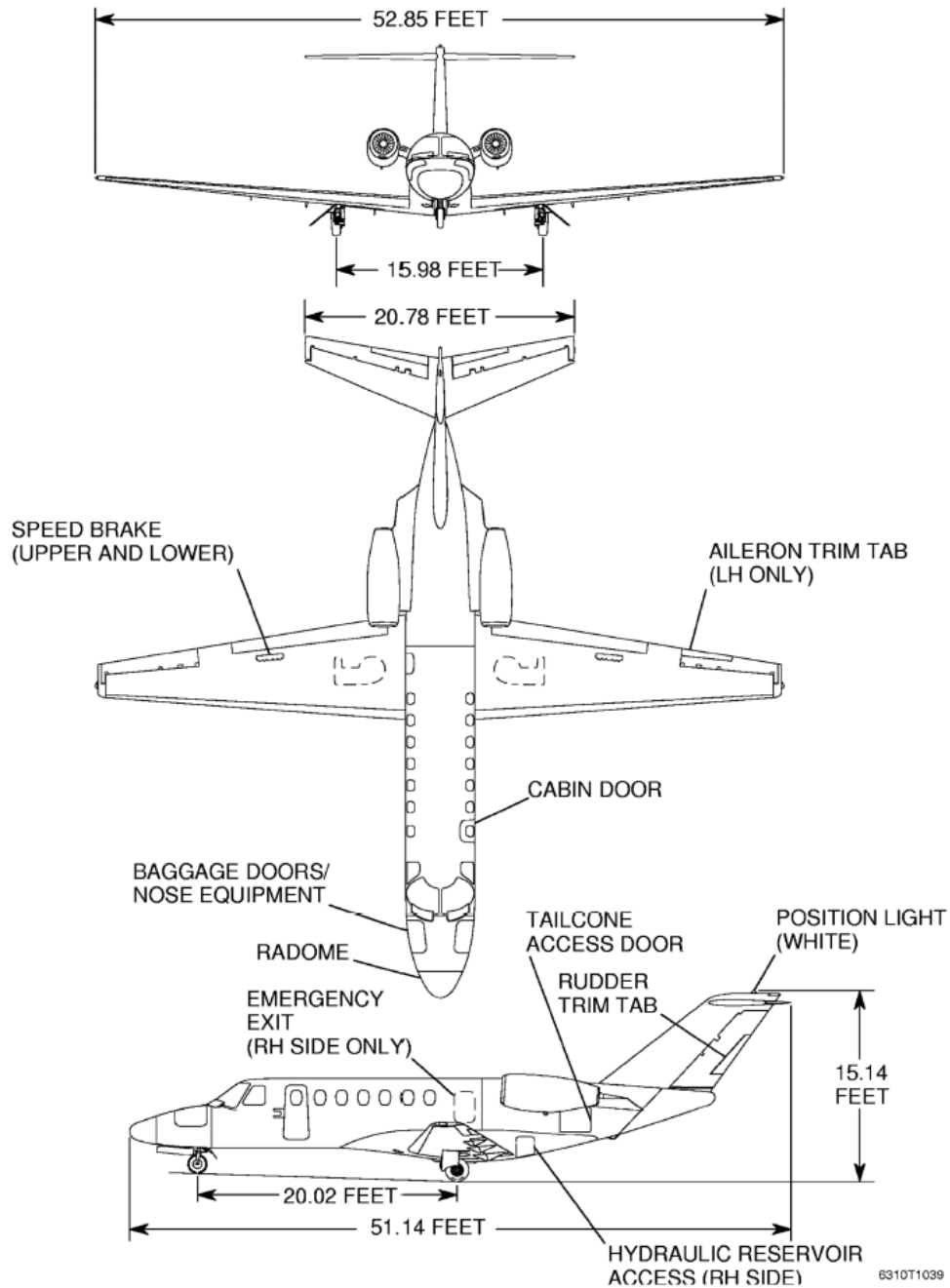


Figure 1-2

Figure A1.1: Cessna 525B three-view drawing.

ATTACHMENT 2: MARTIN STATE AIRPORT (MTN)

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AIRPORT DIAGRAM

AL-5222 (FAA)

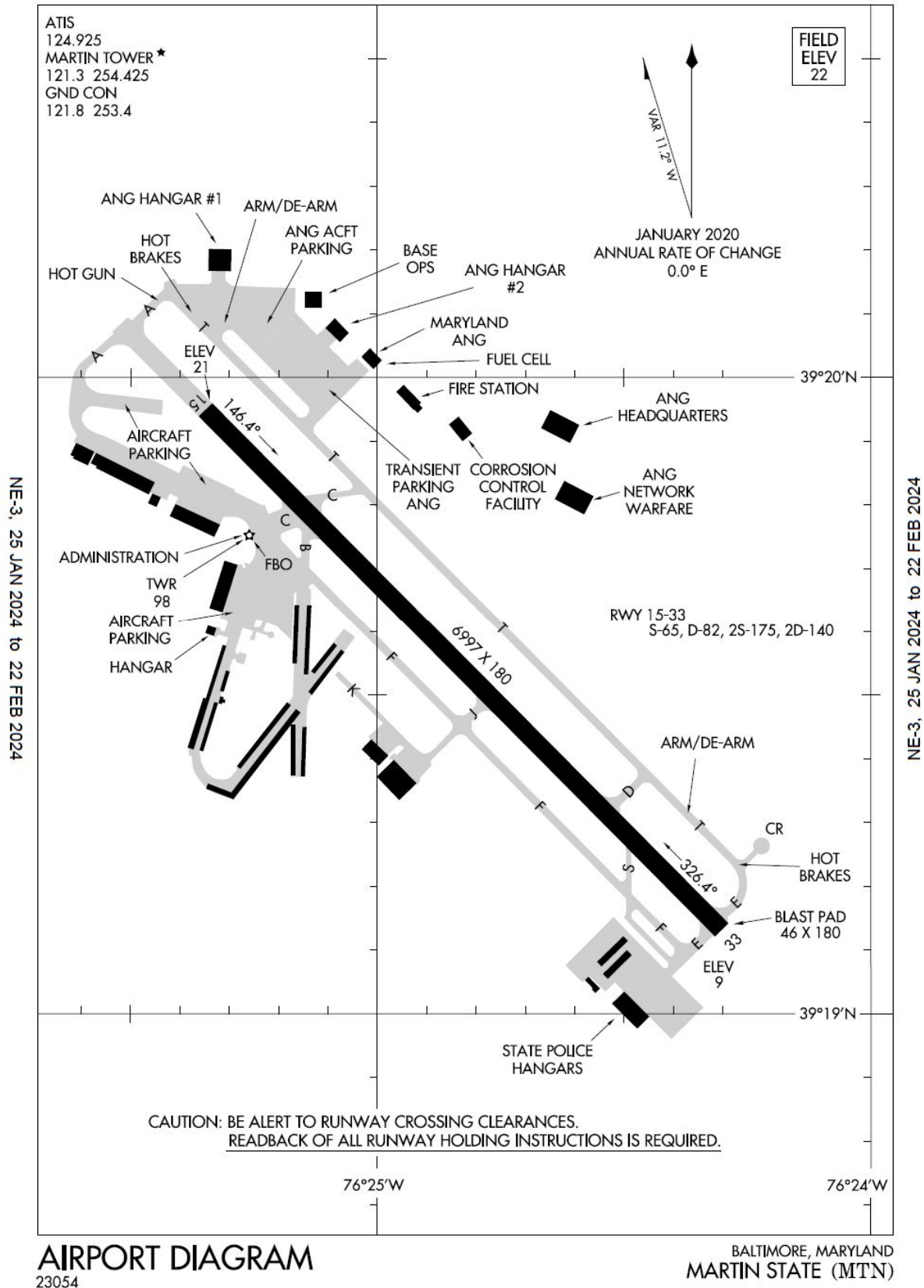
MARTIN STATE (MTN)
BALTIMORE, MARYLAND

Figure A2.1: Martin State Airport (MTN) diagram. N22AU overran the departure end of runway 15.



Figure A2.2: Martin State Airport (MTN) image (Google Earth). Due north is toward the left side of the page.

**ATTACHMENT 3: "AIRPORT" CAMERA IMAGE SEQUENCE
(N22AU SHORT FINAL APPROACH SEGMENT)**

N22AU on short final approach (landing overrun at Martin State Airport, KMTN)



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N22AU on short final approach (landing overrun at Martin State Airport, KMTN)



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N22AU on short final approach (landing overrun at Martin State Airport, KMTN)



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N22AU on short final approach (landing overrun at Martin State Airport, KMTN)



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N22AU on short final approach (landing overrun at Martin State Airport, KMTN)



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ATTACHMENT 4: "AIRPORT" CAMERA IMAGE SEQUENCE
(N22AU LANDING GROUND ROLLOUT SEGMENT)

N22AU subset of ground rollout to final rest position (landing overrun at Martin State Airport, KMTN)



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**ATTACHMENT 5: "AIRPORT" CAMERA IMAGE SEQUENCE
(N22AU LANDING GROUND ROLLOUT SEGMENT - DIGITAL ZOOM)**

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ATTACHMENT 6: PHOTOGRAPHIC EVIDENCE
(N22AU FINAL REST POSITION)



Figure A6.1: N22AU position of final rest beyond departure end of runway 15. Photograph provided to NTSB investigation by Maryland Department of Transportation, Maryland Aviation Administration.



Figure A6.2: N22AU ground track evidence (view looking back toward the departure end of runway 15). Photograph provided to NTSB investigation by Maryland Department of Transportation, Maryland Aviation Administration.



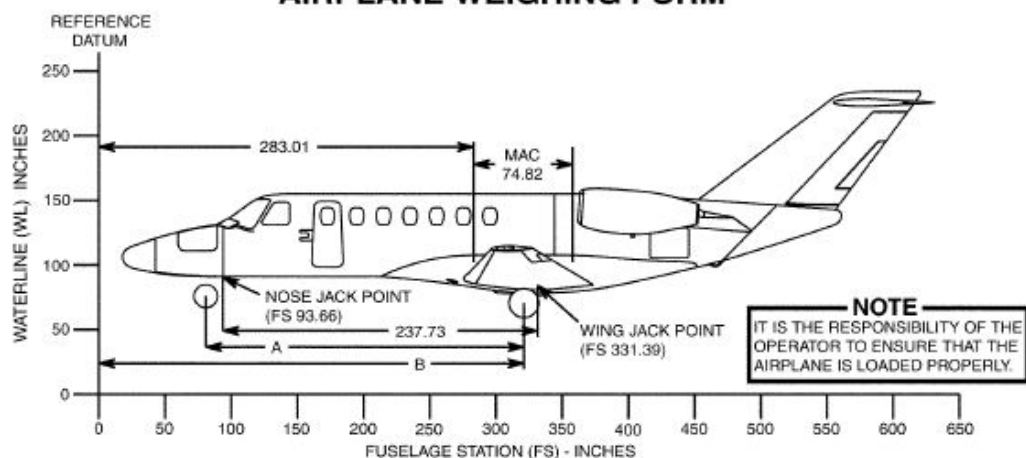
Figure A6.3: N22AU in position of final rest (view looking toward the aircraft and the airport perimeter fence beyond the departure end of runway 15). Photograph provided to NTSB investigation by Maryland Department of Transportation, Maryland Aviation Administration.



Figure A6.4: N22AU in position of final rest (view looking toward the aircraft and the airport perimeter fence beyond the departure end of runway 15). Photograph provided to NTSB investigation by Maryland Department of Transportation, Maryland Aviation Administration.

ATTACHMENT 7: WEIGHT AND BALANCE DATA (N22AU)

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AIRPLANE WEIGHING FORM**LOCATING CG WITH AIRPLANE ON LANDING GEAR****LEGEND**

- DIMENSION A** = Horizontal distance from center of main landing gear axle to center of nose landing gear axle (determined by measurement after airplane is level on scales).
- DIMENSION B** = Horizontal distance from reference datum to center of main landing gear axle. Obtain this distance by measuring from nose jack point FS 93.66 to center of nose landing gear axle and subtracting this value from dimension A and adding to FS 93.66. (Must be measured after airplane is level on scales.)

FORMULA for Longitudinal CG

$$\text{CG Arm of Airplane} = (\text{Dimension B}) - \frac{(\text{Dimension A}) \times (\text{Nose Landing Gear Net Weight})}{\text{Nose and Main Landing Gear Weight Totalled}} = (\quad) \text{ Inches Alt of Datum}$$

LOCATING CG WITH AIRPLANE ON JACK PADS**FORMULA for Longitudinal CG**

$$\text{CG Arm of Airplane} = 331.39 - \frac{237.73 \times (\text{Nose Jack Point Net Weight})}{\text{Nose and Wing Jack Point Weight Totalled}} = (\quad) \text{ Inches Alt of Datum}$$

LEVELING PROVISIONS

LATERAL AND LONGITUDINAL-
USE LEVELING TOOL ACROSS
INBOARD SEAT TRACKS AT
APPROXIMATELY FS 148.00

LOCATING PERCENT MAC**FORMULA for Percent MAC**

$$\text{CG Percent MAC} = \frac{(\text{CG Arm of Airplane}) - 283.01}{0.748}$$

AIRPLANE AS WEIGHED TABLE

POSITION	SCALE READING	SCALE DRIFT	TARE	NET WEIGHT
LEFT WING				
RIGHT WING				
NOSE				
AIRPLANE TOTAL AS WEIGHED				

BASIC EMPTY WEIGHT AND CENTER-OF-GRAVITY TABLE

ITEM	WEIGHT (POUNDS)	CG ARM (INCHES)	MOMENT (INCH-POUNDS/100)
AIRPLANE (CALCULATED OR AS WEIGHED) (INCLUDES ALL UNDRAINABLE FLUIDS AND FULL OIL)			
DRAINABLE UNUSABLE FUEL AT 6.75 POUNDS PER GALLON	44.24	297.22	131.49
BASIC EMPTY WEIGHT			

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FORM NUMBER 21102, 13 October 2004
REVISED 03 November 2004

Locating CG of Airplane (U.S. Units)

Figure 6-1 (Sheet 1 of 5)

FAA APPROVED
525BFM-05

Configuration AA

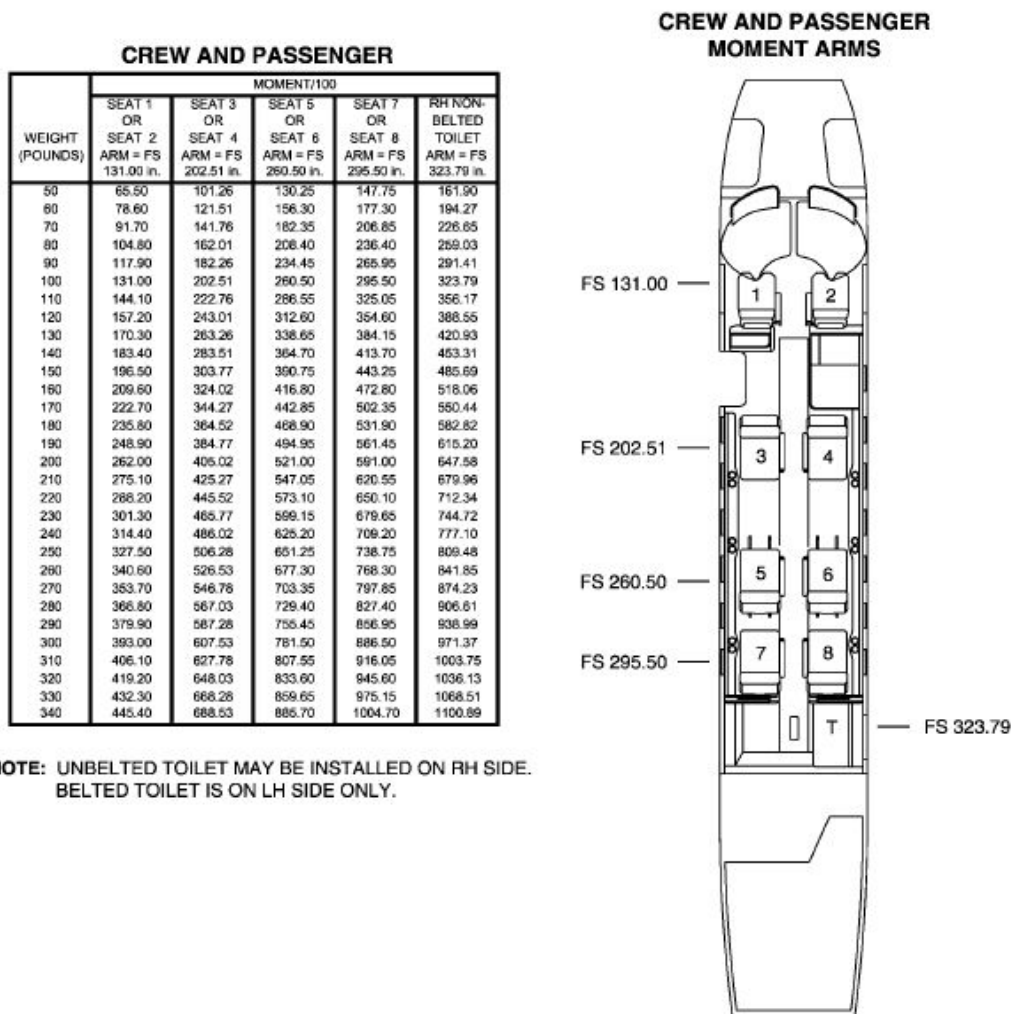
U.S.

6-7

Figure A7.1: Cessna 525B airplane weighing form.

A35159

CREW AND PASSENGERS COMPARTMENTS WEIGHT AND MOMENT TABLES STANDARD CENTER CLUB SEAT ARRANGEMENT



NOTE: UNBELTED TOILET MAY BE INSTALLED ON RH SIDE.
BELTED TOILET IS ON LH SIDE ONLY.

FORM NUMBER 2186, 13 October 2004

Weight And Moment Table (U.S. Units)

Figure 6-2 (Sheet 3)

6-14

U.S.

Configuration AA

FAA APPROVED
525BFM-05

Figure A7.2: Cessna 525B crew and passenger weight and moment tables (standard seat arrangement).

A35228

BAGGAGE AND CABINET COMPARTMENTS STANDARD WEIGHT AND MOMENT TABLES

BAGGAGE AND STORAGE COMPARTMENTS CONTENTS

WEIGHT (POUNDS)	MOMENT/100		
	NOSE COMPARTMENT ARM = FS 74.00 in	*CABIN COMPARTMENT ARM = FS 330.20 in	TAIL/CONE COMPARTMENT ARM = FS 414.60 in
20	14.8	68.0	82.9
40	29.6	132.1	165.8
60	44.4	198.1	248.8
80	59.2	264.2	331.7
100	74.0	330.2	414.6
120	88.8		497.5
140	103.6		580.4
160	118.4		663.4
180	133.2		746.3
200	148.0		829.2
220	162.8		912.1
240	177.6		995.0
260	192.4		1078.0
280	207.2		1160.9
300	222.0		1243.8
320	236.8		1326.7
340	251.6		1409.6
350	259.0		1451.1
360	261.2		1575.5
400	296.0		1658.4
420			1741.3
440			1824.2
460			1907.2
480			1990.1
500			2073.0
520			2155.9
540			2238.8
560			2321.8
580			2404.7
600			2487.6

RH CHART CASE

WEIGHT (POUNDS)	MOMENT/100 NAVIGATION CHART CASE ARM = FS 150.91 in
5	7.55
10	15.09

LH EVAPORATOR CABINET

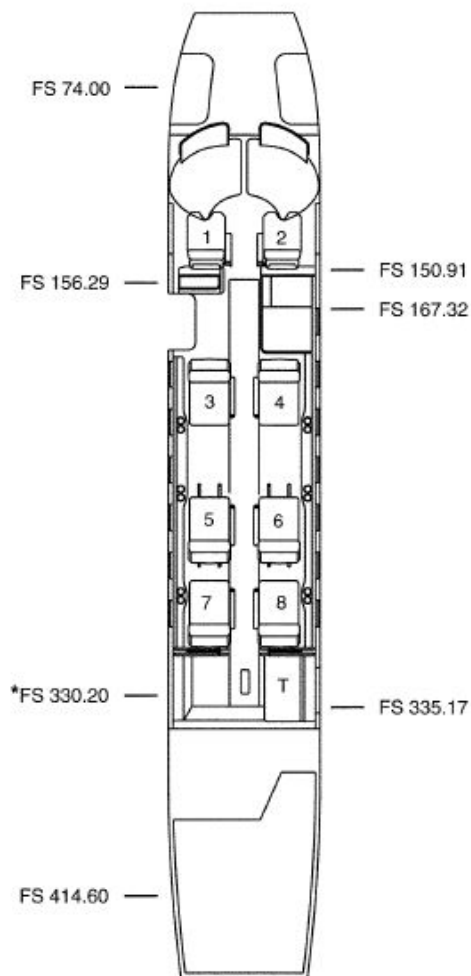
WEIGHT (POUNDS)	MOMENT/100 FORWARD EVAPORATOR ARM = FS 156.29 in
5	7.81
10	15.63
15	23.44
20	31.26
25	39.07
30	46.89
32	50.01

RH REFRESHMENT CENTER

WEIGHT (POUNDS)	MOMENT/100 REFRESHMENT CENTER ARM = FS 167.32 in
10	16.73
20	33.46
30	50.20
40	66.93
50	83.66
60	100.39
70	117.12
80	133.86
90	150.59
100	167.32

RH AFT TOILET CABINET

WEIGHT (POUNDS)	MOMENT/100 AFT TOILET CABINET ARM = FS 335.17 in
1	3.35



*NOTE: THE CABIN STORAGE IS REMOVED WHEN THE LH TOILET IS INSTALLED.

FORM NUMBER 2186, 13 October 2004
REVISED 03 November 2004

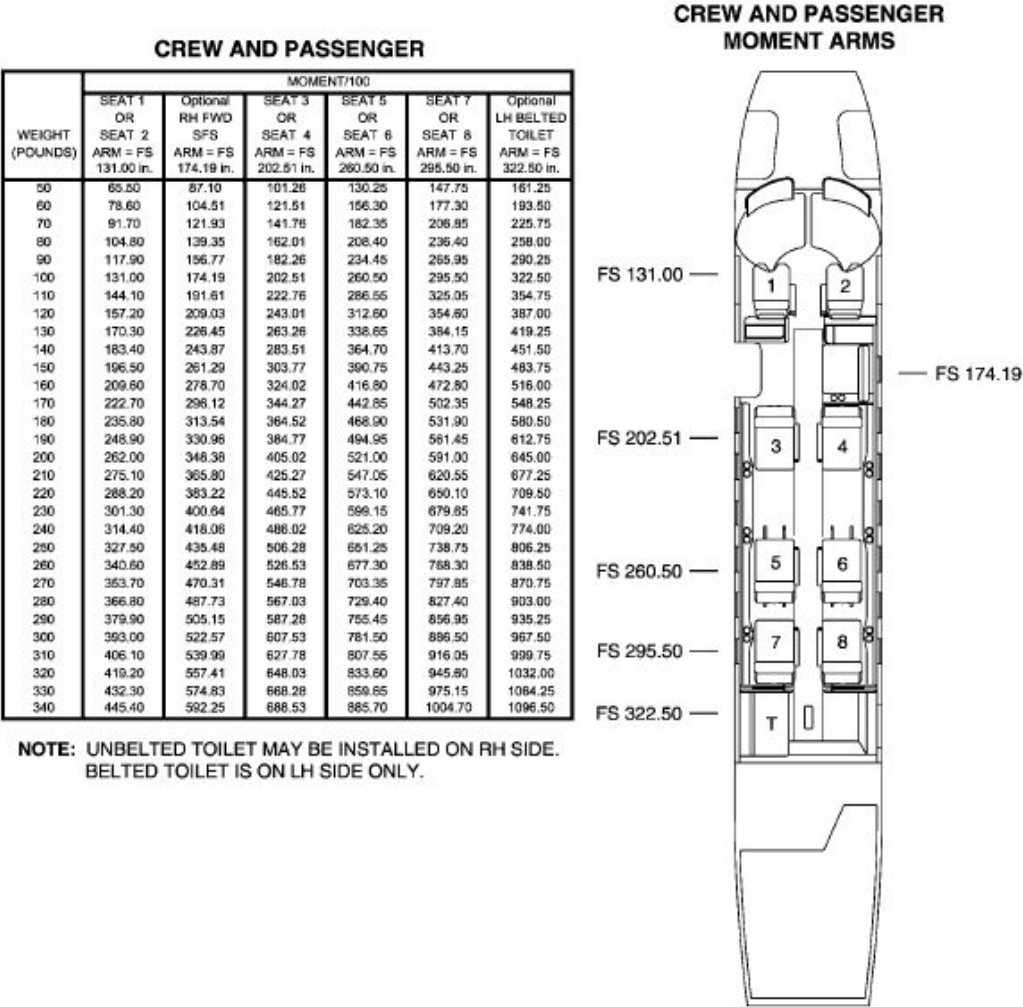
Weight And Moment Table (U.S. Units)

Figure 6-2 (Sheet 7)

Figure A7.3: Cessna 525B baggage and cabinet weight and moment tables (standard arrangement).

A35174

CREW AND PASSENGERS COMPARTMENTS
WEIGHT AND MOMENT TABLES
OPTION 1 CENTER CLUB SEAT ARRANGEMENT



FORM NUMBER 2184, 13 October 2004

Weight And Moment Table (U.S. Units)

Figure 6-2 (Sheet 5)

Figure A7.4: Cessna 525B crew and passenger weight and moment tables (option 1 seat arrangement).

A35349

BAGGAGE AND CABINET COMPARTMENTS OPTION 1 WEIGHT AND MOMENT TABLES

BAGGAGE AND STORAGE COMPARTMENTS CONTENTS

WEIGHT (POUNDS)	MOMENT/100		
	NOSE COMPARTMENT ARM = FS 74.00 in.	*CABIN COMPARTMENT ARM = FS 330.20 in.	TAILCONE COMPARTMENT ARM = FS 414.60 in.
20	14.8	66.0	82.9
40	29.6	132.1	165.8
60	44.4	198.1	248.8
80	59.2	264.2	331.7
100	74.0	330.2	414.6
120	88.8		497.5
140	103.6		580.4
160	118.4		663.4
180	133.2		746.3
200	148.0		829.2
220	162.8		912.1
240	177.6		995.0
260	192.4		1078.0
280	207.2		1160.9
300	222.0		1243.8
320	236.8		1326.7
340	251.6		1409.6
350	259.0		1451.1
380	281.2		1575.5
400	296.0		1658.4
420			1741.3
440			1824.2
460			1907.2
480			1990.1
500			2073.0
520			2155.9
540			2238.8
560			2321.8
580			2404.7
600			2487.6

RH CHART CASE

WEIGHT (POUNDS)	MOMENT/100
	NAVIGATION CHART CASE ARM = FS 150.91 in.
5	7.55
10	15.09

LH EVAPORATOR CABINET

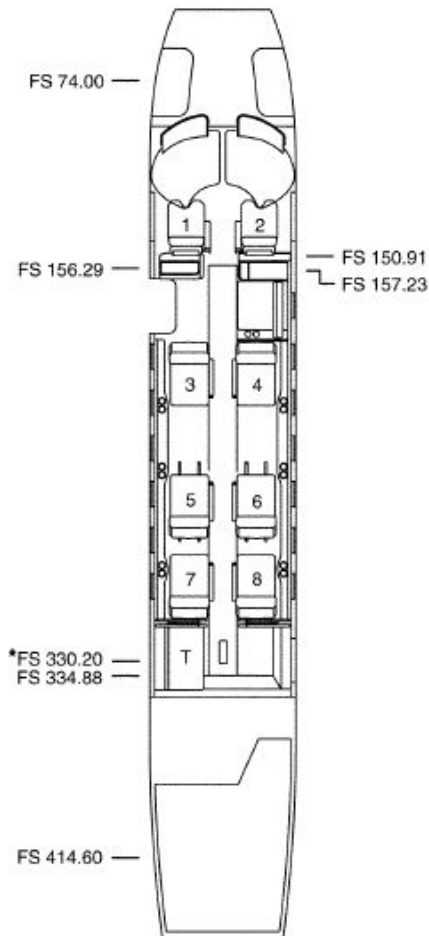
WEIGHT (POUNDS)	MOMENT/100
	FORWARD EVAPORATOR ARM = FS 156.29 in.
5	7.81
10	15.63
15	23.44
20	31.26
25	39.07
30	46.89
32	50.01

RHF SLIMLINE REFRESHMENT CENTER

WEIGHT (POUNDS)	MOMENT/100
	REFRESHMENT CENTER ARM = FS 157.23 in.
5	7.86
10	15.72
15	23.58
20	31.45
25	39.31
30	47.17
35	55.03
40	62.89
45	70.75
50	78.62
53	83.49

LH AFT TOILET CABINET

WEIGHT (POUNDS)	MOMENT/100
	AFT TOILET CABINET ARM = FS 334.88 in.
5.5	18.42



*NOTE: THE CABIN STORAGE IS REMOVED
WHEN THE LH TOILET IS INSTALLED.

FORM NUMBER 2182, 13 October 2004
REVISED 03 November 2004

Weight And Moment Table (U.S. Units)

Figure 6-2 (Sheet 9)

6-20

U.S.

Configuration AA

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525BFM-05

Figure A7.5: Cessna 525B baggage and cabinet weight and moment tables (option 1 arrangement).

A35230

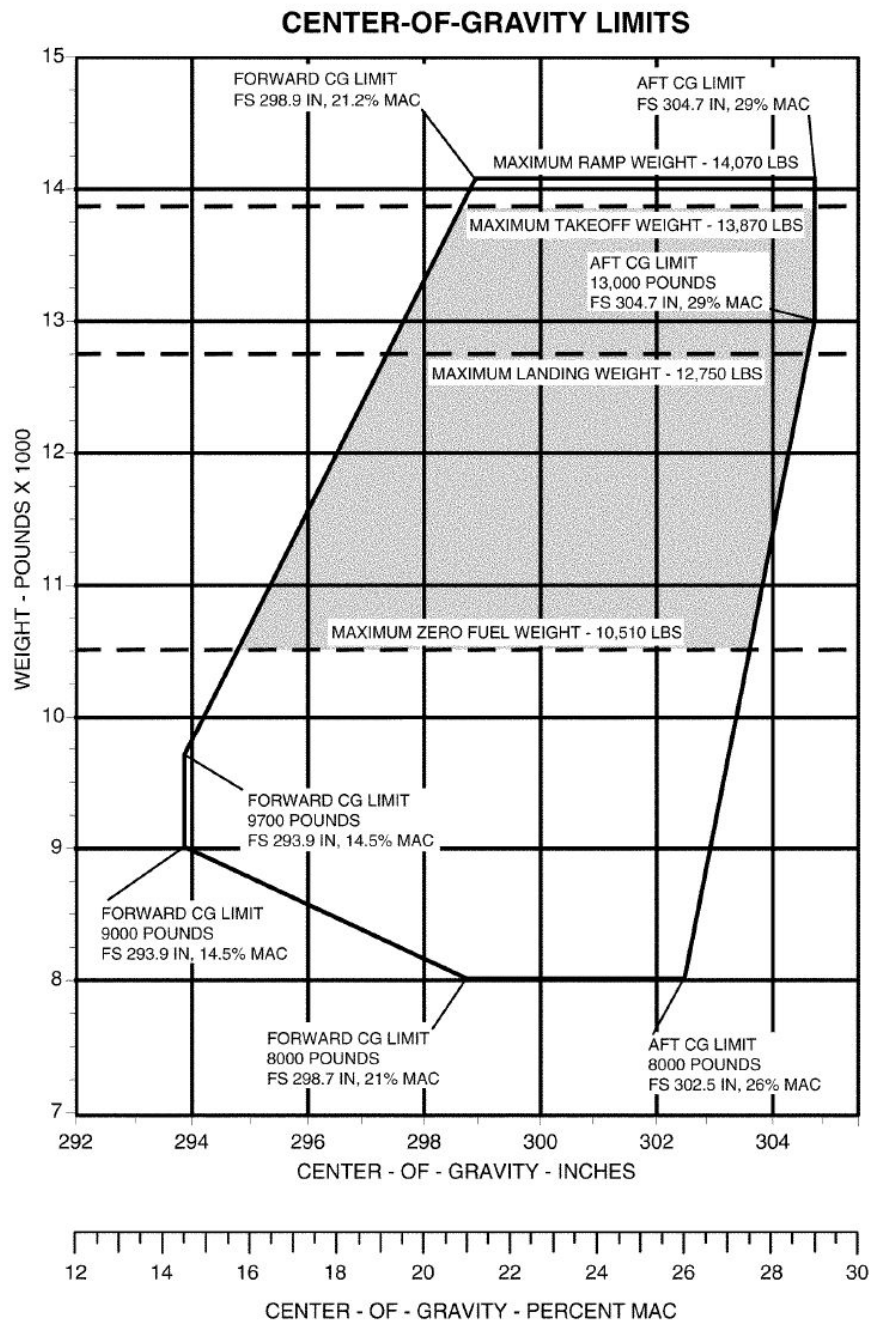


Figure 2-1

Figure A7.6: Cessna 525B weight and balance envelope.

A35232

WEIGHT AND BALANCE COMPUTATION FORM

PAYLOAD COMPUTATIONS				ITEM	WEIGHT (POUNDS)	MOMENT/ 100
'A'	'B'	'C'	'D'	'E'	'F'	'G'
ITEM	ARM (INCHES)	WEIGHT (POUNDS)	MOMENT/ 100			
				1. BASIC EMPTY WEIGHT *Airplane CG = _____	8160	25,167
OCCUPANTS				2. PAYLOAD	1640	4086
PILOT	131.0	170	223	3. ZERO FUEL WEIGHT (sub-total) Do not exceed maximum zero fuel weight of 10,510 pounds. *Airplane CG = _____	9800	29,253
COPILOT	131.0	170	223			
SEAT 3	202.5	170	344	4. FUEL LOADING	4050	12,570
SEAT 4	202.5	170	344	5. RAMP WEIGHT (sub-total) Do not exceed maximum ramp weight of 14,070 pounds. *Airplane CG = _____ ***	13,850	41,823
SEAT 5	260.5	170	443	6. LESS FUEL FOR TAXIING	200	620
SEAT 6	260.5	170	443	7. TAKEOFF WEIGHT ** Do not exceed maximum takeoff weight of 13,870 pounds. *Airplane CG = _____	13,650	41,203
SEAT 7	295.5	170	502	8. LESS FUEL TO DESTINATION	2100	6491
SEAT 8	295.5	170	502	9. LANDING WEIGHT ** Do not exceed maximum landing weight of 12,750 pounds. *Airplane CG = _____	11,550	34,712
TOILET	322.5	170				
SIDE FACING SEAT	174.2	170				
CONTENTS				* Airplane CG = $\frac{\text{MOMENT}/100}{\text{WEIGHT}} \times 100$		
LH CHART CASE	150.9	0	0	** Totals must be within approved weight and center-of-gravity limits. It is the responsibility of the operator to ensure that the airplane is loaded properly. The Basic Empty Weight CG is noted on the Airplane Weighing Form. If the airplane has been altered, refer to the Weight and Balance Record for information.		
RH REF CENTER	167.3	40	67			
LH EVAP CABINET	156.3					
VANITY STORAGE	335.2					
NOSE BAGGAGE	74.0					
CAB STORAGE	330.2					
TAILCONE BAGGAGE	414.6	240	995			
PAYLOAD (sub-total)		1640	4086	*** Enter the Center-of-Gravity Limits Envelope Graph to verify airplane is loaded within approved limits.		

FORM NUMBER 2178, 13 October 2004
REVISED 03 November 2004

Sample Weight and Balance Computation Form (U.S. Units)

Figure 6-4 (Sheet 1 of 2)

6-24

U.S.

Configuration AA

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525BFM-05

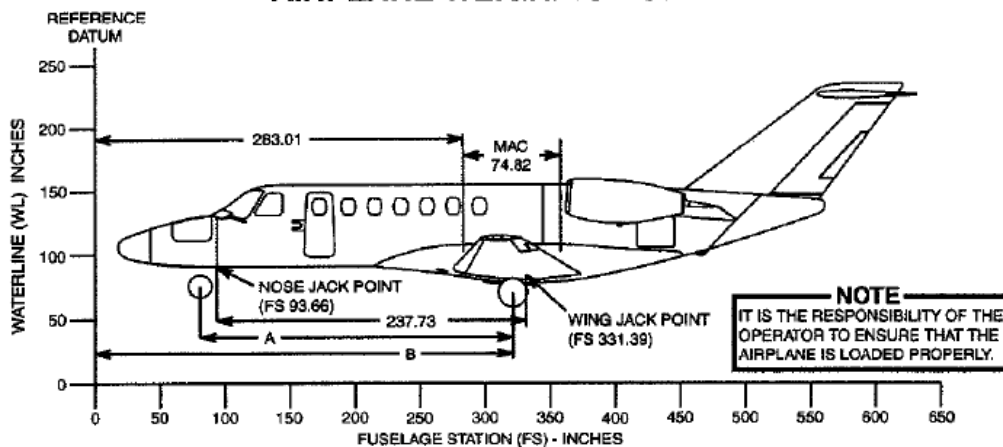
Figure A7.7: Cessna 525B itemized weight and balance buildup (sample form).

525B0304

2/27/2009

A27783

AIRPLANE WEIGHING FORM

**LOCATING CG WITH AIRPLANE ON LANDING GEAR****LEGEND**

DIMENSION A = Horizontal distance from center of main landing gear axle to center of nose landing gear axle (determined by measurement after airplane is level on scales).

DIMENSION B = Horizontal distance from reference datum to center of main landing gear axle. Obtain this distance by measuring from nose jack point FS 93.66 to center of nose landing gear axle and subtracting this value from dimension A and adding to FS 93.66. (Must be measured after airplane is level on scales.)

FORMULA for Longitudinal CG

$$\text{CG Arm of Airplane} = \frac{(\text{Dimension A}) \times (\text{Nose Landing Gear Net Weight})}{\text{Nose and Main Landing Gear Weight Totalled}} = (\text{Inches}) \text{ Aft of Datum}$$

LOCATING CG WITH AIRPLANE ON JACK PADS**FORMULA for Longitudinal CG**

$$\text{CG Arm of Airplane} = \frac{237.73 \times (\text{Nose Jack Point Net Weight})}{\text{Nose and Wing Jack Point Weight Totalled}} = (\text{Inches}) \text{ Aft of Datum}$$

LEVELING PROVISIONS

LATERAL AND LONGITUDINAL-
USE LEVELING TOOL ACROSS
INBOARD SEAT TRACKS AT
APPROXIMATELY FS 148.00

LOCATING PERCENT MAC**FORMULA for Percent MAC**

$$\text{CG Percent MAC} = \frac{(\text{CG Arm of Airplane}) - 283.01}{0.748}$$

AIRPLANE AS WEIGHED TABLE

POSITION	SCALE READING	SCALE DRIFT	TARE	NET WEIGHT
LEFT WING	3707.00	0.00	0.00	3707.00
RIGHT WING	3707.00	0.00	0.00	3707.00
NOSE	834.00	0.00	0.00	834.00
AIRPLANE TOTAL AS WEIGHED				8248.00

BASIC EMPTY WEIGHT AND CENTER-OF-GRAVITY TABLE

ITEM	WEIGHT (POUNDS)	CG ARM (INCHES)	MOMENT (INCH-POUNDS/100)
AIRPLANE (CALCULATED OR AS WEIGHED) (INCLUDES ALL UNDRAINABLE FLUIDS AND FULL OIL)	8248.00	307.35	25350.23
DRAINABLE UNUSABLE FUEL AT 6.75 POUNDS PER GALLON	44.24	297.22	131.49
See attached sheet	1.10	266.36	2.93
BASIC EMPTY WEIGHT	8293.34	307.29	25484.65

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FORM NUMBER 2182, 13 October 2004
REVISED 03 November 2004

Locating CG of Airplane (U.S. Units)

Figure 6-1 (Sheet 1 of 5)

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525BFM-05

Configuration AA

U.S.

6-7

Figure A7.8: N22AU maintenance weight record (as delivered by TXTAV, dated Feb. 2009).



Weight and Balance Summary

Aircraft Tail No. **N22AU**

Aircraft Serial No. 304

AFM W/B information date: 5/5/2021

Form updated by: RILE
Date: 210625

Reason for update: NEW AIRCRAFT / 3 YEAR

Last 3 yr Weighing: 210505

<u>Description</u>	<u>Weight</u>	<u>Moments</u>	<u>Arm</u>	<u>% MAC</u>
Aircraft Empty Weight	8374.24	2576311.81	307.65	
Airshare Standard Stock Data	106	19745.9		
Basic Empty Data* >>>>>	8480	<u>2596057.71</u>	306.13	30.91

**Does not include crew data*

The Basic Empty Data depicted on this form is the data provided in the approved weight and balance control methods. If these values do not match what is depicted in the electronic weight and balance systems, contact Compliance immediately. 816-410-8107

A096 Approved Weight & Balance Methods:

Primary Weight & Balance Method: APG iPreflight (including ArincDirect)

Back-Up Method: www.flyapg.com Login to "Web Performance" Username: xsripf Password: xsr

Figure A7.9: N22AU maintenance weight record (per AirShare, dated May 2021).

A35236

WEIGHT AND BALANCE COMPUTATION FORM

PAYLOAD COMPUTATIONS				ITEM	WEIGHT (POUNDS)	MOMENT/ 100
'A'	'B'	'C'	'D'	'E'	'F'	'G'
ITEM	ARM (INCHES)	WEIGHT (POUNDS)	MOMENT/ 100			
OCCUPANTS PILOT COPILOT				1. BASIC EMPTY WEIGHT *Airplane CG = _____		
				2. PAYLOAD		
				3. ZERO FUEL WEIGHT (sub-total) Do not exceed maximum zero fuel weight of 10,510 pounds. *Airplane CG = _____		
				4. FUEL LOADING		
				5. RAMP WEIGHT (sub-total) Do not exceed maximum ramp weight of 14,070 pounds. *Airplane CG = _____ ***	***	
				6. LESS FUEL FOR TAXIING		
				7. TAKEOFF WEIGHT ** Do not exceed maximum takeoff weight of 13,870 pounds. *Airplane CG = _____	***	
CONTENTS				8. LESS FUEL TO DESTINATION		
LH CHART CASE	150.9			9. LANDING WEIGHT ** Do not exceed maximum landing weight of 12,750 pounds. *Airplane CG = _____		
RH REF CENTER	167.3					
LH EVAP CABINET	156.3					
VANITY STORAGE	335.2					
NOSE BAGGAGE	74.0			* Airplane CG = $\frac{\text{MOMENT}/100}{\text{WEIGHT}} \times 100$		
CAB STORAGE	330.2			** Totals must be within approved weight and center-of-gravity limits. It is the responsibility of the operator to ensure that the airplane is loaded properly. The Basic Empty Weight CG is noted on the Airplane Weighing Form. If the airplane has been altered, refer to the Weight and Balance Record for information.		
TAILCONE BAGGAGE	414.6					
PAYLOAD (sub-total)				*** Enter the Center-of-Gravity Limits Envelope Graph to verify airplane is loaded within approved limits.		

FORM NUMBER 217B, 13 October 2004
REVISED 03 November 2004

Weight and Balance Computation Form (U.S. Units)

Figure 6-6 (Sheet 1 of 2)

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U.S.

Configuration AA

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525BFM-05

Figure A7.10: Cessna 525B itemized weight and balance buildup (blank form).

ATTACHMENT 8: CESSNA 525B LANDING PERFORMANCE

Based on Airplane Flight Manual (AFM)

Note: Yellow box text highlights in this attachment were added by NTSB staff

Landing Performance (Citation CJ3 — 525BFM-XX)

Performance analysis generated:

Date / System Time	= 25-Mar-22 / 12:27:06
Program Version	= 5.0 Build 0
Airport Database Expiration Date	= 22-Jun-16
AFM Supplement	= 15

Requested Condition:

Departure Airport/Runway Information

Arrival Airport ID	= KMTN
Arrival Airport	= MARTIN STATE
Arrival Runway	= 15
Available Runway Length	= 6997 ft
Runway Gradient	= -0.17 %
Runway Surface	= Dry, Paved

ATIS Information

Airport Elevation	= 21 ft
Altimeter Setting	= 29.79 inHG
Outside Air Temperature	= 23 °C
Wind Direction / Speed	= 210° / 12 knots

Aircraft Configuration

Selected Landing Weight	= 12750 lbs
Approach Flap Setting	= 15°
Landing Flap Setting	= LAND
Anti-Ice Setting	= OFF

Performance Output:

FAA APPROVED DATA

Landing Performance

Pressure Altitude	= 143 ft
Headwind / Crosswind	= 5 / 11 (Right) knots
LND Weight (lbs)	= 12750 lbs
VAPP / VREF	= 117 / 108 KIAS
Act. Land Dist. (from 50 ft screen height)	= 2896 ft
APP / LND Gross Climb Grad.	= 9.6 / 25.9 %

Figure A8.1: Calculated Cessna 525B landing performance for winds from 210° at 12 knots.

Landing Performance (Citation CJ3 — 525BFM-XX)

Performance analysis generated:

Date / System Time	= 25-Mar-22 / 12:28:06
Program Version	= 5.0 Build 0
Airport Database Expiration Date	= 22-Jun-16
AFM Supplement	= 15

Requested Condition:

Departure Airport/Runway Information

Arrival Airport ID	= KMTN
Arrival Airport	= MARTIN STATE
Arrival Runway	= 15
Available Runway Length	= 6997 ft
Runway Gradient	= -0.17 %
Runway Surface	= Dry, Paved

ATIS Information

Airport Elevation	= 21 ft
Altimeter Setting	= 29.79 inHG
Outside Air Temperature	= 23 °C
Wind Direction / Speed	= 210° / 21 knots

Aircraft Configuration

Selected Landing Weight	= 12750 lbs
Approach Flap Setting	= 15°
Landing Flap Setting	= LAND
Anti-Ice Setting	= OFF

Performance Output:

FAA APPROVED DATA

Landing Performance

Pressure Altitude	= 143 ft
Headwind / Crosswind	= 9 / 19 (Right) knots
LND Weight (lbs)	= 12750 lbs
VAPP / VREF	= 117 / 108 KIAS
Act. Land Dist. (from 50 ft screen height)	= 2830 ft
APP / LND Gross Climb Grad.	= 9.8 / 26.4 %

Figure A8.2: Calculated Cessna 525B landing performance for winds from 210° at 21 knots.

BEFORE LANDING

1. Landing Gear - DOWN and LOCKED.
2. Flaps - LAND.
3. Pressurization - CHECK ZERO DIFFERENTIAL.
4. Autopilot and Yaw Damper - OFF.
5. Airspeed - V_{REF} .
6. Speed Brakes - RETRACTED PRIOR TO 50 FEET AGL.

LANDING

1. Throttles - IDLE.
2. brakes - apply (after nosewheel touchdown).

CAUTION

If during landing a no braking condition is encountered, operate the emergency brake system. Maintenance is required before the next flight.

NOTE

- To obtain maximum braking performance from the antiskid system, the pilot must apply continuous maximum effort (no modulation) to the brake pedals.
- The antiskid system does not provide wheel skid protection below approximately 12 knots groundspeed.
- The NO TAKEOFF annunciator will illuminate at touchdown with flaps in the LAND (35°) position.

3. Flaps - GROUND FLAPS.

NOTE

The FLAPS >35° annunciator may illuminate if the nose is held up for aerodynamic braking.

ALL ENGINES GO-AROUND

1. Throttles - TO Detent.
2. Airplane Pitch Attitude - POSITIVE ROTATION TO +7.5° (reference go-around mode on flight director).
3. Flaps - TAKEOFF AND APPROACH.
4. Climb Speed - V_{APP} .
5. Landing Gear - UP (when positive rate-of-climb is established).
6. Flaps - UP.
7. Throttles - MCT Detent or AS REQUIRED.

Figure A8.3: Cessna 525B AFM normal landing procedure.

PERFORMANCE - GENERAL**REGULATORY COMPLIANCE**

Information in this section is presented for the purpose of compliance with the appropriate performance criteria and certification requirements of 14 CFR Part 23 and applicable special conditions.

STANDARD PERFORMANCE CONDITIONS

All performance in this manual is based on flight test data and the following conditions:

1. Thrust ratings include the installation, bleed air and accessory losses.
2. Full temperature accountability within the operational limits for which the airplane is certified.

NOTE

Should ambient air temperature or altitude be below the lowest temperature or altitude shown on the performance charts, use the performance at the lowest value shown.

3. Wing flap positions as follows:

	Flap Handle Position	Flap Deflection
a. Takeoff	UP and TO/APPR	0° and 15°
b. Enroute	UP	0°
c. Approach	TO/APPR	15°
d. Landing	LAND	35°
	GROUND FLAPS	55°

4. All takeoff and landing performance is based on a paved, dry runway.
5. The takeoff performance was obtained using the following procedures and conditions:

SINGLE ENGINE TAKEOFF - ACCELERATE GO

- a. The thrust was set to takeoff detent, N_1 's were stabilized, then the brakes were released.
- b. The pilot recognized engine failure at V_1 .
- c. The airplane continued to accelerate to V_R at which time positive rotation (3° to 5° per second) to $+10$ degrees nose up pitch attitude was made. Pitch attitude was adjusted as required to achieve V_2 upon reaching 35 feet AGL.
- d. The landing gear was retracted after reaching 35 feet AGL.
- e. V_2 was maintained from the 35-foot point above the runway to 1500 feet AGL.

(Continued Next Page)

Figure A8.4: Cessna 525B AFM takeoff and landing performance data conditions.

STANDARD PERFORMANCE CONDITIONS (Continued)

SINGLE ENGINE TAKEOFF - ACCELERATE STOP

- a. The thrust was set to takeoff detent, N_1 's were stabilized, then the brakes were released.
- b. The pilot recognized the necessity to stop because of engine failure or other reasons just prior to V_1 .
- c. Maximum pilot braking effort was started at V_1 and continued until the airplane came to a stop.
- d. Both throttles were brought to idle immediately after brake application.
- e. Directional control was maintained through the rudder pedals and differential braking as required.
- f. Antiskid was ON during all tests.
- g. Speedbrakes and ground flaps were not used.

MULTI-ENGINE TAKEOFF

- a. The thrust was set to takeoff detent, N_1 's were stabilized, then the brakes were released.
 - b. Positive rotation (3° to 5° per second) to $+10$ degrees was made at V_R accelerating to $V_2 + 12$ KIAS (Flaps 15°) or $V_2 + 15$ KIAS (Flaps 0°) and pitch adjusted as required to maintain $V_2 + 12$ KIAS (Flaps 15°) or $V_2 + 15$ KIAS (Flaps 0°) (V_{35}).
 - c. The landing gear was retracted when a positive climb rate was established.
 - d. $V_2 + 12$ KIAS (Flaps 15°) or $V_2 + 15$ KIAS (Flaps 0°) was maintained from the 35-foot point above the runway until the obstacle was cleared, at which time, the airplane was accelerated and the flaps were retracted.
6. The landing performance was obtained using the following procedures and conditions:

LANDING

- a. Landing preceded by a steady three degree angle approach down to the 50-foot height point with airspeed at V_{REF} in the landing configuration.
- b. Two engine thrust setting during approach was selected to maintain the three degree approach angle at V_{REF} .
- c. Idle thrust was established at the 50-foot height point and throttles remained in that setting until the airplane had stopped.
- d. Rotation to a landing attitude was accomplished at a normal rate.
- e. Maximum wheel braking was initiated immediately on nose wheel contact and continued throughout the landing roll. Ground flaps were selected immediately after brake application.
- f. The antiskid system was ON during all tests.
- g. Speed brakes were disabled (i.e. no performance credit).

Figure A8.5: Cessna 525B AFM takeoff and landing performance data conditions.

PROCEDURES FOR USE OF APPROACH AND LANDING PERFORMANCE TABLES

1. Determine gross weight of airplane at the time of arrival at the destination airport.
2. Obtain airport information; i.e., active runway, available runway length, temperature, altitude, wind, icing conditions and runway gradient if applicable. Determine that the temperature is within the ambient temperature limits found in Section II, Limitations.
3. Determine wind component parallel to active runway from the crosswind component chart (Figure 4-13).
4. Check the maximum landing weight permitted by climb requirements and the brake energy limits (Figures 4-49, if anti-ice systems are OFF; Figures 4-48 and 4-49, if anti-ice systems are ON). If these limitations restrict the landing weight, the pilot must burn off fuel prior to landing.
5. Determine the landing distance, V_{APP} and V_{REF} from Figure 4-50 (flaps land), then apply the appropriate factors from the note below. If the available runway length is less than the landing distance required, the airplane landing weight must be reduced.

NOTE

- Multiply the FLAPS LAND landing distance by 1.20 for a -1 percent (downhill) runway gradient or by 1.73 for a -2 percent (downhill) runway gradient. For positive (uphill) runway gradients, use the landing distance obtained from Figure 4-50.
- For inoperative antiskid system, multiply the landing distance obtained from Figure 4-50 by 1.5.

6. The approach climb and landing climb gradient tables are presented in Figures 4-51, 4-52, 4-53, and 4-54.

NOTE

These procedures apply for normal landings at or below 12,750 pounds. Performance above 12,750 pounds is provided as additional information, for use in an emergency which requires a landing at a weight in excess of the maximum design landing weight of 12,750 pounds.

Figure A8.6: Cessna 525B AFM procedures for use of landing performance tables.

LANDING DISTANCE - FEET **ACTUAL DISTANCE** **FLAPS - LAND**
SEA LEVEL

CONDITIONS: LANDING GEAR - DOWN
THRUST - IDLE AT 50 FEET
AIRSPEED - VREF AT 50 FEET

ANTI-ICE - ON OR OFF
GROUND FLAPS - AFTER TOUCHDOWN

SOME CONDITIONS MAY BE BRAKE ENERGY OR CLIMB LIMITED. OBTAIN ALLOWABLE WEIGHT FROM MAXIMUM LANDING WEIGHT TABLES.

*WEIGHT = 13870 POUNDS VREF = 112 KIAS VAPP = 122 KIAS						WEIGHT = 12750 POUNDS VREF = 108 KIAS VAPP = 117 KIAS					
TEMP DEG C	TAILWIND 10 KTS	ZERO WIND	HEADWINDS 10 KTS	20 KTS	30 KTS	TEMP DEG C	TAILWIND 10 KTS	ZERO WIND	HEADWINDS 10 KTS	20 KTS	30 KTS
-25	3210	2640	2490	2340	2190	-25	3020	2490	2340	2190	2060
-20	3250	2680	2520	2370	2220	-20	3050	2520	2370	2220	2090
-15	3290	2720	2560	2400	2260	-15	3090	2550	2400	2250	2120
-10	3330	2760	2600	2440	2290	-10	3130	2590	2430	2290	2150
-5	3380	2790	2630	2470	2330	-5	3170	2620	2460	2320	2180
0	3420	2830	2670	2510	2360	0	3210	2650	2500	2350	2210
5	3470	2870	2710	2550	2400	5	3250	2690	2540	2390	2240
10	3520	2920	2750	2590	2430	10	3290	2730	2570	2420	2270
15	3570	2960	2790	2630	2470	15	3340	2770	2610	2460	2310
20	3620	3000	2830	2670	2510	20	3380	2810	2650	2490	2340
25	3670	3040	2870	2710	2550	25	3430	2850	2690	2530	2380
30	3720	3090	2910	2750	2590	30	3470	2890	2720	2560	2410
35	3770	3130	2950	2790	2620	35	3520	2920	2760	2600	2440
40	3820	3180	3000	2820	2660	40	3560	2960	2800	2630	2480
45	3870	3220	3040	2860	2700	45	3610	3000	2830	2670	2510
50	3920	3260	3080	2900	2740	50	3650	3040	2870	2700	2550
54	3960	3300	3110	2930	2770	54	3680	3070	2900	2730	2580

WEIGHT = 12600 POUNDS VREF = 107 KIAS VAPP = 117 KIAS						WEIGHT = 12400 POUNDS VREF = 106 KIAS VAPP = 116 KIAS					
TEMP DEG C	TAILWIND 10 KTS	ZERO WIND	HEADWINDS 10 KTS	20 KTS	30 KTS	TEMP DEG C	TAILWIND 10 KTS	ZERO WIND	HEADWINDS 10 KTS	20 KTS	30 KTS
-25	3000	2460	2320	2180	2040	-25	2960	2440	2290	2150	2010
-20	3030	2500	2350	2200	2070	-20	3000	2470	2320	2180	2040
-15	3070	2530	2380	2230	2100	-15	3030	2500	2350	2210	2070
-10	3100	2560	2410	2270	2130	-10	3070	2540	2390	2240	2100
-5	3140	2600	2440	2300	2160	-5	3110	2570	2410	2270	2130
0	3180	2630	2480	2330	2190	0	3140	2600	2450	2300	2160
5	3220	2670	2510	2370	2220	5	3190	2640	2480	2340	2190
10	3270	2710	2550	2400	2250	10	3230	2680	2520	2370	2230
15	3310	2750	2590	2430	2290	15	3270	2710	2560	2400	2260
20	3350	2780	2620	2470	2320	20	3310	2750	2590	2440	2290
25	3400	2820	2660	2500	2360	25	3360	2790	2630	2470	2330
30	3440	2860	2700	2540	2390	30	3400	2820	2660	2510	2360
35	3480	2900	2730	2580	2420	35	3440	2860	2700	2540	2390
40	3530	2940	2770	2610	2460	40	3490	2900	2740	2580	2430
45	3570	2980	2810	2640	2490	45	3530	2940	2770	2610	2460
50	3620	3010	2840	2680	2520	50	3570	2980	2810	2650	2490
54	3650	3040	2870	2710	2550	54	3610	3010	2830	2670	2520

WEIGHT = 12200 POUNDS VREF = 106 KIAS VAPP = 115 KIAS						WEIGHT = 12000 POUNDS VREF = 105 KIAS VAPP = 114 KIAS					
TEMP DEG C	TAILWIND 10 KTS	ZERO WIND	HEADWINDS 10 KTS	20 KTS	30 KTS	TEMP DEG C	TAILWIND 10 KTS	ZERO WIND	HEADWINDS 10 KTS	20 KTS	30 KTS
-25	2930	2410	2270	2130	1990	-25	2900	2390	2240	2100	1970
-20	2970	2440	2300	2160	2020	-20	2940	2420	2270	2130	1990
-15	3000	2470	2330	2190	2050	-15	2970	2450	2300	2160	2020
-10	3040	2510	2360	2210	2080	-10	3010	2480	2330	2190	2050
-5	3070	2540	2390	2240	2110	-5	3040	2510	2360	2220	2080
0	3110	2570	2420	2270	2140	0	3070	2540	2390	2250	2110
5	3150	2610	2450	2310	2170	5	3120	2580	2430	2280	2140
10	3190	2640	2490	2340	2200	10	3160	2610	2460	2320	2180
15	3230	2680	2530	2380	2230	15	3200	2650	2500	2350	2220
20	3280	2720	2560	2410	2270	20	3240	2690	2530	2380	2240
25	3320	2760	2600	2440	2300	25	3280	2720	2570	2410	2270
30	3360	2790	2630	2480	2330	30	3320	2760	2600	2450	2300
35	3400	2830	2670	2510	2360	35	3360	2800	2630	2480	2340
40	3440	2860	2700	2550	2400	40	3410	2830	2670	2520	2370
45	3490	2900	2740	2580	2430	45	3440	2870	2700	2550	2400
50	3530	2940	2770	2610	2460	50	3490	2900	2740	2580	2430
54	3560	2970	2800	2640	2490	54	3520	2930	2770	2610	2460

TO OBTAIN LANDING DISTANCE WITH NEGATIVE (DOWNHILL) RUNWAY GRADIENT, REFER TO LANDING PROCEDURES
* FOR USE IN AN EMERGENCY WHICH REQUIRES LANDING IN EXCESS OF THE MAXIMUM DESIGN LANDING WEIGHT OF 12750 POUNDS

Figure 4-50* (Sheet 1 of 22)

4-362.1

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Figure A8.7: Cessna 525B AFM normal landing procedure.

LANDING DISTANCE - FEET **ACTUAL DISTANCE** **FLAPS - LAND 1000 FEET**

CONDITIONS: LANDING GEAR - DOWN
THRUST - IDLE AT 50 FEET
AIRSPEED - VREF AT 50 FEET

ANTI-ICE - ON OR OFF
GROUND FLAPS - AFTER TOUCHDOWN

SOME CONDITIONS MAY BE BRAKE ENERGY OR CLIMB LIMITED. OBTAIN ALLOWABLE WEIGHT FROM MAXIMUM LANDING WEIGHT TABLES.

*WEIGHT = 13870 POUNDS VREF = 112 KIAS VAPP = 122 KIAS					
TEMP DEG C	TAILWIND 10 KTS	ZERO WIND	HEADWINDS 10 KTS	20 KTS	30 KTS
-25	3290	2720	2560	2400	2260
-20	3330	2760	2590	2440	2290
-15	3380	2800	2630	2470	2330
-10	3420	2830	2670	2510	2360
-5	3470	2870	2710	2550	2400
0	3520	2920	2750	2590	2430
5	3570	2960	2790	2630	2470
10	3620	3010	2830	2670	2510
15	3670	3050	2870	2710	2550
20	3730	3090	2920	2750	2590
25	3780	3140	2960	2790	2630
30	3830	3180	3000	2830	2670
35	3880	3230	3040	2870	2710
40	3940	3270	3090	2910	2750
45	3990	3320	3130	2950	2790
50	4040	3360	3180	3000	2820
51	4060	3370	3180	3000	2830

WEIGHT = 12750 POUNDS VREF = 108 KIAS VAPP = 117 KIAS					
TEMP DEG C	TAILWIND 10 KTS	ZERO WIND	HEADWINDS 10 KTS	20 KTS	30 KTS
-25	3090	2550	2400	2250	2110
-20	3130	2590	2430	2290	2150
-15	3170	2620	2470	2320	2180
-10	3210	2650	2500	2350	2210
-5	3250	2690	2530	2390	2240
0	3290	2730	2570	2420	2270
5	3340	2770	2610	2460	2310
10	3380	2810	2650	2490	2340
15	3430	2850	2690	2530	2380
20	3480	2890	2720	2570	2410
25	3520	2930	2760	2600	2450
30	3570	2970	2800	2640	2490
35	3620	3010	2840	2680	2520
40	3660	3050	2880	2710	2560
45	3710	3090	2920	2750	2590
50	3750	3130	2960	2790	2630
52	3770	3150	2970	2800	2640

WEIGHT = 12600 POUNDS VREF = 107 KIAS VAPP = 117 KIAS					
TEMP DEG C	TAILWIND 10 KTS	ZERO WIND	HEADWINDS 10 KTS	20 KTS	30 KTS
-25	3070	2530	2380	2230	2100
-20	3100	2560	2410	2270	2130
-15	3140	2600	2440	2300	2160
-10	3180	2630	2480	2330	2190
-5	3220	2670	2510	2360	2220
0	3260	2700	2550	2400	2250
5	3310	2740	2590	2430	2290
10	3350	2790	2620	2470	2320
15	3400	2820	2660	2510	2360
20	3440	2860	2700	2540	2390
25	3490	2900	2740	2580	2430
30	3540	2940	2780	2610	2460
35	3580	2980	2810	2650	2500
40	3630	3020	2850	2690	2530
45	3670	3060	2890	2730	2570
50	3720	3100	2930	2760	2600
52	3740	3120	2940	2780	2610

WEIGHT = 12400 POUNDS VREF = 106 KIAS VAPP = 116 KIAS					
TEMP DEG C	TAILWIND 10 KTS	ZERO WIND	HEADWINDS 10 KTS	20 KTS	30 KTS
-25	3030	2500	2350	2210	2070
-20	3070	2540	2390	2240	2100
-15	3110	2570	2420	2270	2130
-10	3150	2600	2450	2300	2160
-5	3190	2640	2480	2340	2190
0	3230	2670	2520	2370	2220
5	3270	2710	2560	2400	2260
10	3310	2750	2590	2440	2290
15	3360	2790	2630	2480	2330
20	3410	2830	2670	2510	2360
25	3450	2870	2700	2550	2400
30	3490	2910	2740	2590	2430
35	3540	2950	2780	2620	2470
40	3580	2990	2820	2650	2500
45	3630	3020	2850	2690	2540
50	3670	3060	2890	2730	2570
52	3690	3080	2910	2740	2580

WEIGHT = 12200 POUNDS VREF = 106 KIAS VAPP = 115 KIAS					
TEMP DEG C	TAILWIND 10 KTS	ZERO WIND	HEADWINDS 10 KTS	20 KTS	30 KTS
-25	3000	2470	2330	2190	2050
-20	3040	2510	2360	2210	2080
-15	3070	2540	2390	2240	2110
-10	3110	2570	2420	2280	2140
-5	3150	2600	2450	2310	2170
0	3190	2640	2490	2340	2200
5	3230	2680	2530	2380	2230
10	3280	2720	2560	2410	2270
15	3320	2760	2600	2450	2300
20	3360	2800	2630	2480	2340
25	3410	2830	2670	2520	2370
30	3450	2870	2710	2550	2400
35	3490	2910	2750	2590	2430
40	3540	2950	2780	2620	2470
45	3580	2990	2820	2660	2500
50	3630	3020	2850	2690	2540
52	3650	3040	2870	2710	2550

WEIGHT = 12000 POUNDS VREF = 105 KIAS VAPP = 114 KIAS					
TEMP DEG C	TAILWIND 10 KTS	ZERO WIND	HEADWINDS 10 KTS	20 KTS	30 KTS
-25	2970	2450	2300	2160	2020
-20	3010	2480	2330	2190	2050
-15	3040	2510	2360	2220	2080
-10	3080	2540	2400	2250	2110
-5	3110	2580	2420	2280	2140
0	3150	2610	2460	2310	2170
5	3200	2650	2500	2350	2200
10	3240	2690	2530	2380	2240
15	3280	2730	2570	2420	2270
20	3320	2760	2600	2450	2310
25	3370	2800	2640	2490	2340
30	3410	2840	2680	2520	2370
35	3450	2870	2710	2560	2400
40	3500	2910	2750	2590	2440
45	3540	2950	2790	2620	2470
50	3580	2990	2820	2660	2510
52	3600	3000	2830	2670	2520

TO OBTAIN LANDING DISTANCE WITH NEGATIVE (DOWNHILL) RUNWAY GRADIENT, REFER TO LANDING PROCEDURES
* FOR USE IN AN EMERGENCY WHICH REQUIRES LANDING IN EXCESS OF THE MAXIMUM DESIGN LANDING WEIGHT OF 12750 POUNDS

Figure 4-50* (Sheet 3)

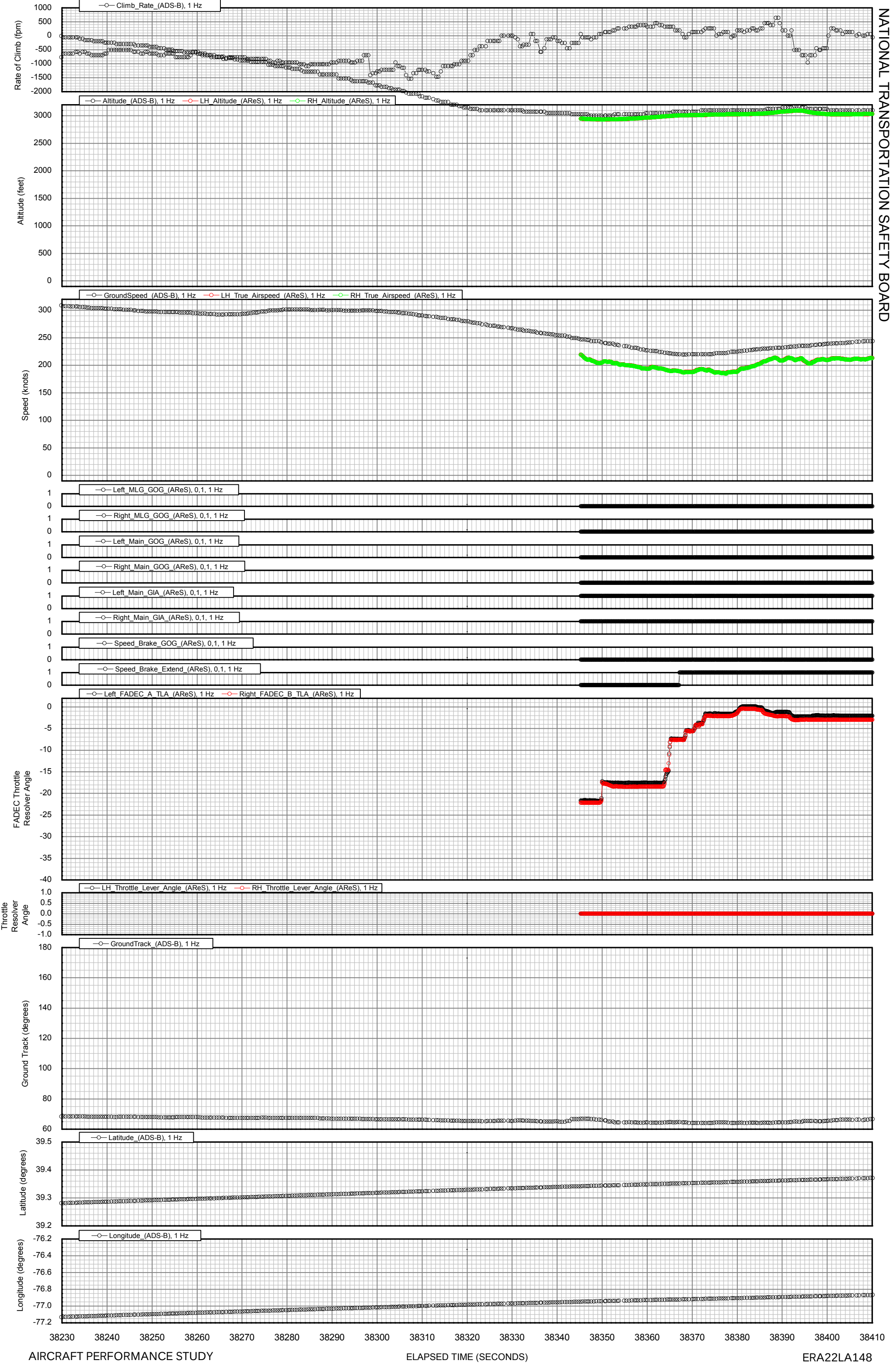
Figure A8.8: Cessna 525B AFM normal landing procedure.

ATTACHMENT 9: COCKPIT VOICE RECORDER (CVR) DATA (PARAPHRASED EVENT SUBSET)

HH	MM	SS	Elapsed	Paraphrased CVR event
10	29	30.2	37770.2	"Comment regarding landing gear retraction after takeoff."
10	34	08.9	38048.9	"0954 MTN ATIS - wind 180 @ 16 gust 23, visibility of 10 statute miles, no clouds under 12k (clear), localizer approach runway 15 in use."
10	46	20.0	38780.0	"Comment regarding landing reference speed."
10	46	35.9	38795.9	"Automated 500 feet AGL callout."
10	47	30.9	38850.9	"Comment regarding ground flaps."
10	47	32.5	38852.5	"Aircraft touchdown."
10	47	39.4	38859.4	"Comment regarding issues with braking."
10	48	11.7	38891.7	"Aircraft departed paved surface."

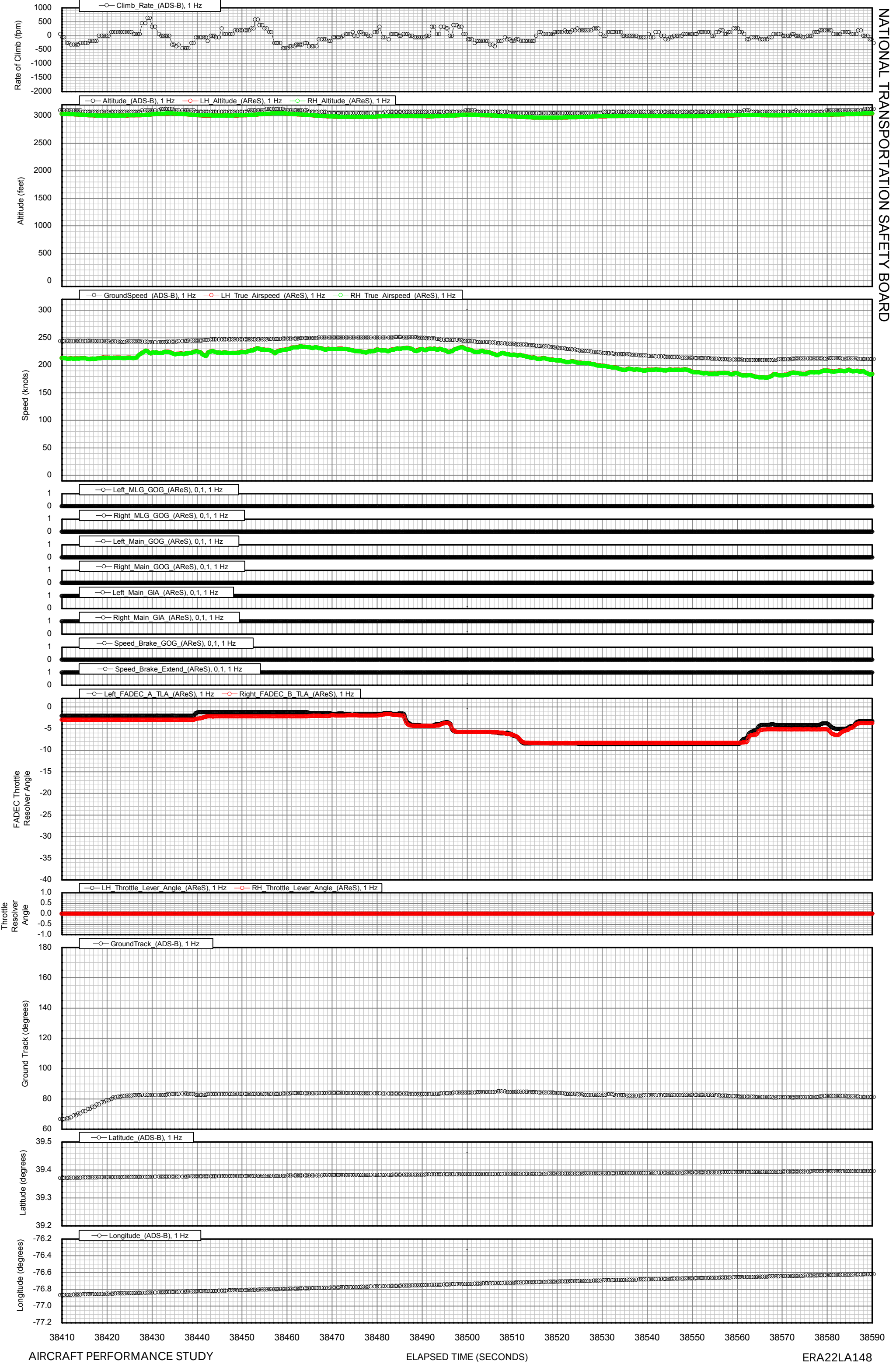
ATTACHMENT 10: CESSNA AIRCRAFT EVENT RECORDING SYSTEM (ARES) DATA

CESSNA 525B (N22AU) LANDING OVERRUN [ADS-B & CESSNA AReS DATA, NTSB ERA22LA148]
RUNWAY 15, MARTIN STATE AIRPORT (MTN), MIDDLE RIVER, MARYLAND, MARCH 7, 2022



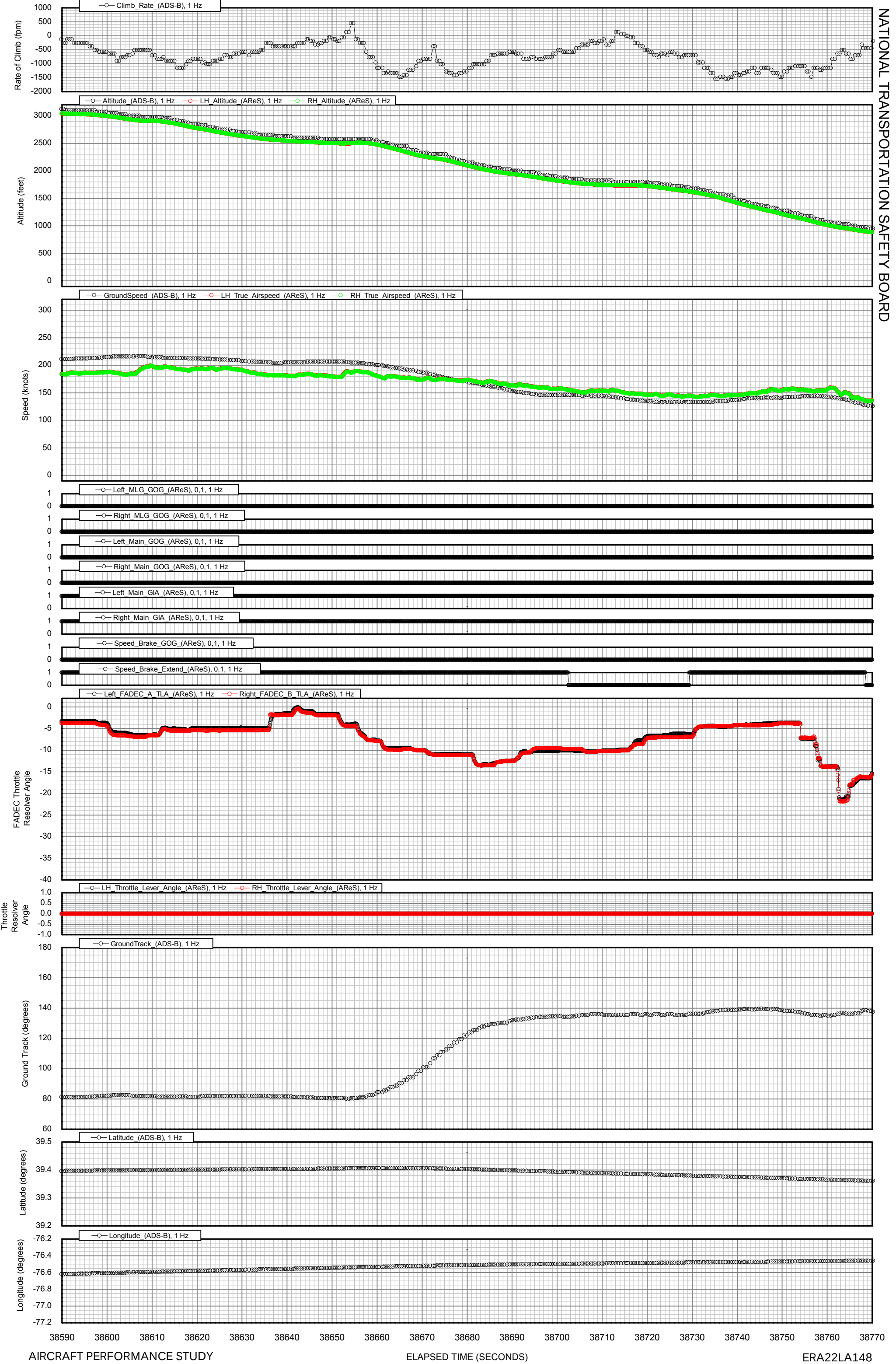
NATIONAL TRANSPORTATION SAFETY BOARD

CESSNA 525B (N22AU) LANDING OVERRUN [ADS-B & CESSNA AReS DATA, NTSB ERA22LA148]
RUNWAY 15, MARTIN STATE AIRPORT (MTN), MIDDLE RIVER, MARYLAND, MARCH 7, 2022



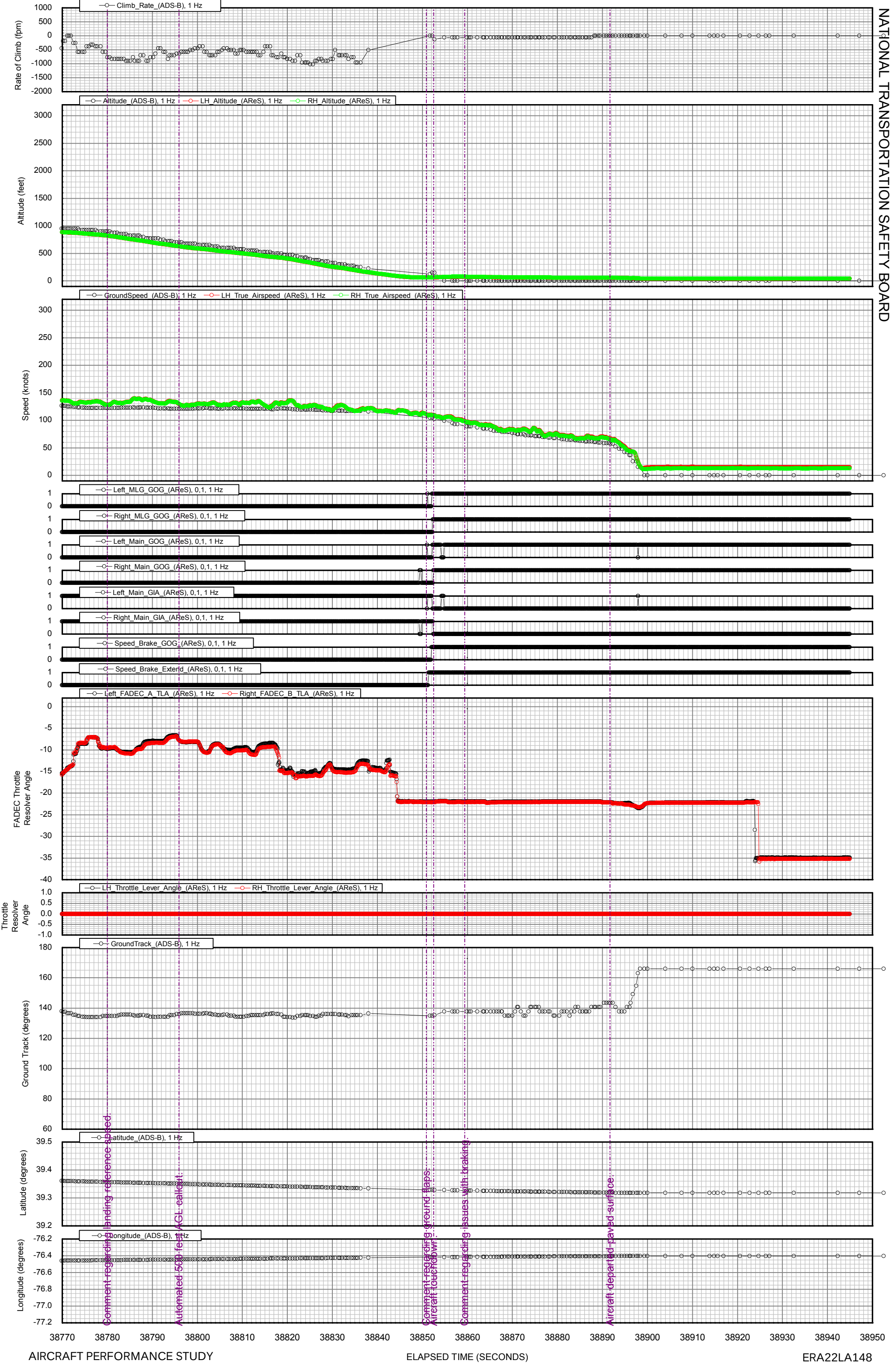
NATIONAL TRANSPORTATION SAFETY BOARD

CESSNA 525B (N22AU) LANDING OVERRUN [ADS-B & CESSNA AReS DATA, NTSB ERA22LA148]
RUNWAY 15, MARTIN STATE AIRPORT (MTN), MIDDLE RIVER, MARYLAND, MARCH 7, 2022



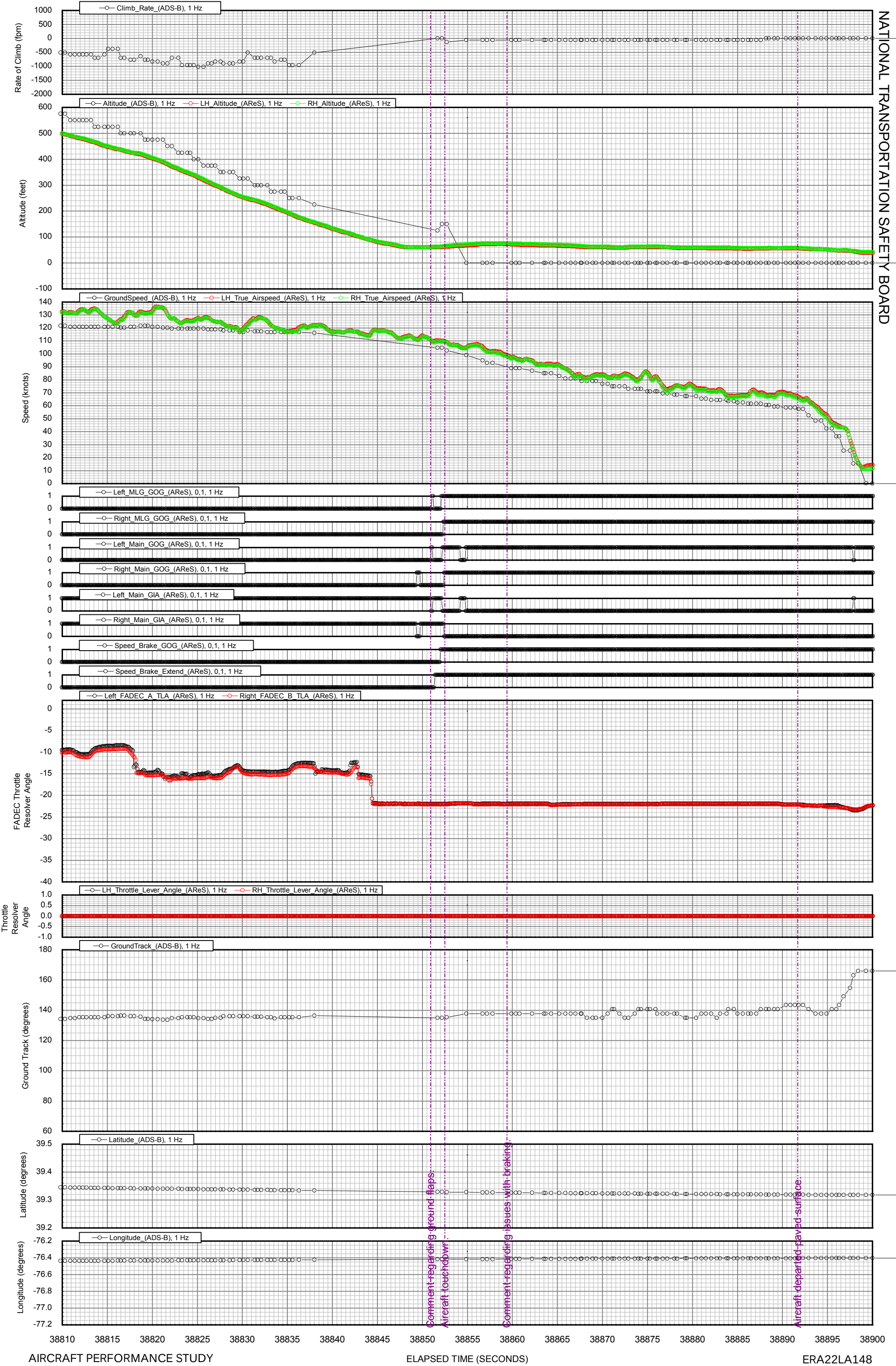
NATIONAL TRANSPORTATION SAFETY BOARD

CESSNA 525B (N22AU) LANDING OVERRUN [ADS-B & CESSNA AReS DATA, NTSB ERA22LA148]
RUNWAY 15, MARTIN STATE AIRPORT (MTN), MIDDLE RIVER, MARYLAND, MARCH 7, 2022



NATIONAL TRANSPORTATION SAFETY BOARD

CESSNA 525B (N22AU) LANDING OVERRUN [ADS-B & CESSNA AReS DATA, NTSB ERA22LA148]
RUNWAY 15, MARTIN STATE AIRPORT (MTN), MIDDLE RIVER, MARYLAND, MARCH 7, 2022



NATIONAL TRANSPORTATION SAFETY BOARD

ATTACHMENT 11: ACCIDENT FLIGHT PATH RECONSTRUCTION (N22AU)



Figure A11.1: N22AU accident flight path reconstruction showing short final approach to 1,000 feet along MTN runway 15. N22AU direction of travel is upper left to lower right. Ground track reconstruction is based on Automatic Dependent Surveillance - Broadcast (ADS-B) data (white text), paraphrased CVR events (green text), Cessna Aircraft Recording System (ARes) parametric data (yellow events), airport surveillance camera video content, and runway witness mark evidence. Due north is toward the top of the page.



Figure A11.2: N22AU accident flight path reconstruction showing 1,000 to 3,000 feet along MTN runway 15. N22AU direction of travel is upper left to lower right. Ground track reconstruction is based on Automatic Dependent Surveillance - Broadcast (ADS-B) data (white text), paraphrased CVR events (green text), Cessna Aircraft Recording System (ARes) parametric data (yellow events), airport surveillance camera video content, and runway witness mark evidence. Main landing gear touchdown and speed brake nomenclature: LH=left hand, RH=right hand, GOG=gear on ground, GIA=gear in air, SpdBrk=upper and lower wing speed brakes. Due north is toward the top of the page.



Figure A11.3: N22AU accident flight path reconstruction showing 3,000 to 5,000 feet along MTN runway 15. N22AU direction of travel is upper left to lower right. Ground track reconstruction is based on Automatic Dependent Surveillance - Broadcast (ADS-B) data (white text), paraphrased CVR events (green text), Cessna Aircraft Recording System (ARes) parametric data (yellow events), airport surveillance camera video content, and runway witness mark evidence. Due north is toward the top of the page.

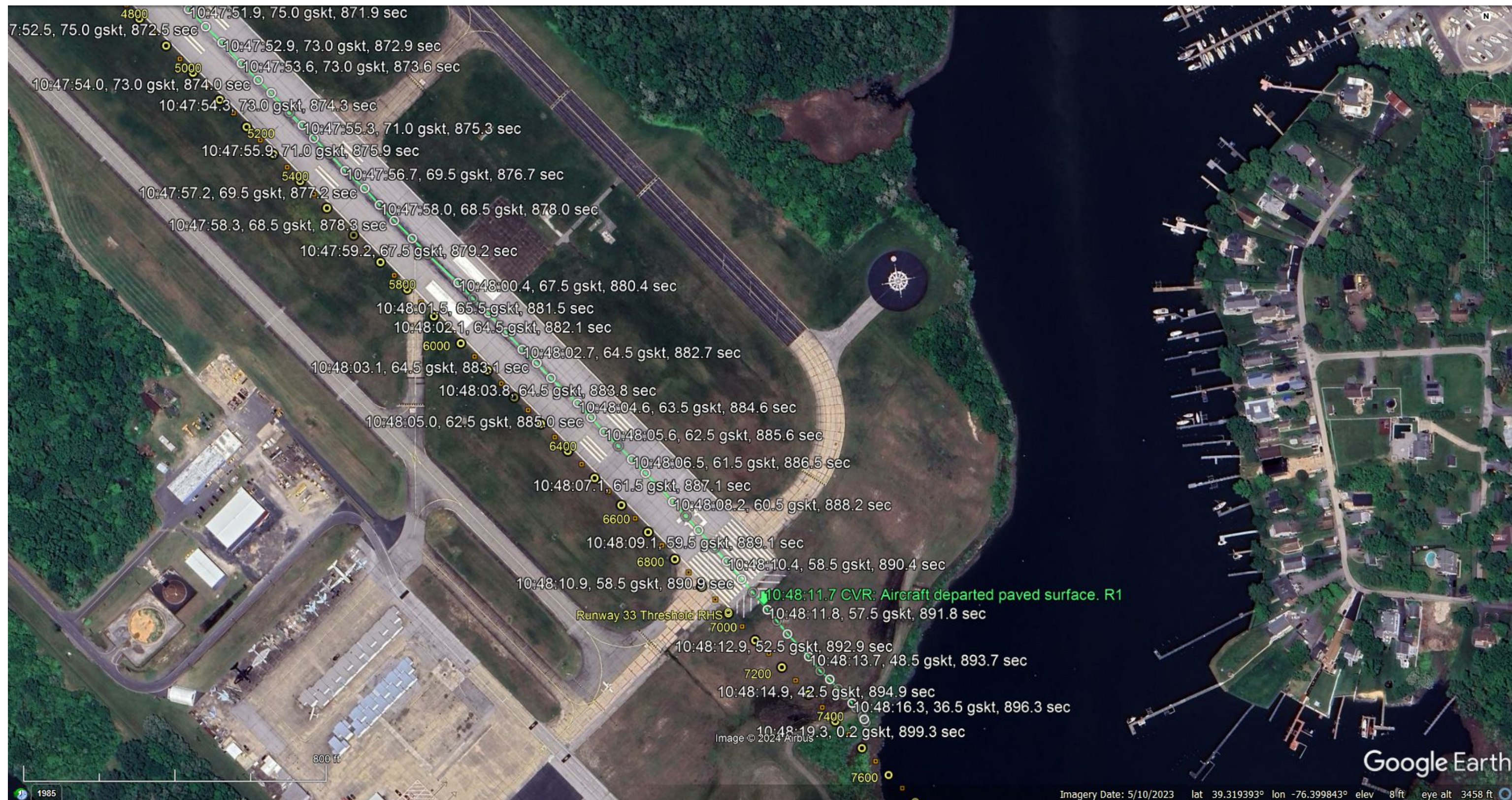


Figure A11.4: N22AU accident flight path reconstruction showing 5,000 to 7,000 feet along MTN runway 15. N22AU direction of travel is upper left to lower right. Ground track reconstruction is based on Automatic Dependent Surveillance - Broadcast (ADS-B) data (white text), paraphrased CVR events (green text), Cessna Aircraft Recording System (ARes) parametric data (yellow events), airport surveillance camera video content, and runway witness mark evidence. Due north is toward the top of the page.



Figure A11.5: N22AU accident flight path reconstruction showing 1,500 to 2,500 feet along MTN runway 15. N22AU direction of travel is upper left to lower right. Ground track reconstruction is based on Automatic Dependent Surveillance - Broadcast (ADS-B) data (white text), paraphrased CVR events (green text), Cessna Aircraft Recording System (ARes) parametric data (yellow events), airport surveillance camera video content, and runway witness mark evidence. Main landing gear touchdown and speed brake nomenclature: LH=left hand, RH=right hand, GOG=gear on ground, GIA=gear in air, SpdBrk=upper and lower wing speed brakes. Due north is toward the top of the page.



Figure A11.6: N22AU accident flight path reconstruction showing 6,500 to 7,500 feet along MTN runway 15. N22AU direction of travel is upper left to lower right. Ground track reconstruction is based on Automatic Dependent Surveillance - Broadcast (ADS-B) data (white text), paraphrased CVR events (green text), Cessna Aircraft Recording System (ARes) parametric data (yellow events), airport surveillance camera video content, and runway witness mark evidence. Due north is toward the top of the page.

ATTACHMENT 12: CESSNA 525B AFM EXCERPTS

Note: Yellow box text highlights in this attachment were added by NTSB staff

HYDRAULIC SYSTEM (Continued)

LANDING GEAR

The landing gear is actuated by positioning the landing gear lever to either the extend or retract position. During gear extension, hydraulic pressure retracts the uplocks and then extends the gear actuators. The actuators mechanically lock in the extend position. Upon retraction, hydraulic pressure unlocks the actuators and retracts the gear into the uplocks. Hydraulic pressure automatically shuts off when the gear are down and locked on extension or up and locked on retraction.

Three green annunciators illuminate when the nose, left main or right main gear are down and locked. These lights are not illuminated in the retracted position. A red GEAR UNLOCKED annunciator is illuminated anytime all landing gear are not locked in the position selected by the landing gear handle.

A "LANDING GEAR" or tone audio warning is provided by the warning/caution advisory system if either of the following conditions occur and the landing gear are not down.

1. Airspeed below 130 KIAS, and either throttle is below approximately 85% N₂. Warning can be silenced.
2. Flaps are extended beyond the Takeoff and Approach Setting. Warning cannot be silenced.

Emergency landing gear extension is provided by two emergency gear handles located below the landing gear handle. Pulling the "T" handle retracts the uplocks, allowing the landing gear to free fall to the extend position. Some yawing may be required to achieve green lights on all gear. Rotating the extended "T" handle 1/4 turn clockwise will lock the handle. After the "T" handle has been pulled, the round collar handle can be pulled to discharge the nitrogen blow down system. Nitrogen will retract the uplocks, in the event they did not release mechanically, and then extend the gear. After the gear is extended, the collar and "T" handle can be pushed in for knee clearance. If significant resistance is encountered, the handle should be left extended to prevent cable crimping.

CAUTION

- Prior to using the emergency extension system, the landing gear handle must be down to prevent possible energizing of the gear hydraulic system to the retract position.
- Once the emergency gear extension system has been used, do not attempt to raise the gear.

FLAP/GROUND FLAPS 55°/SPEED BRAKES

The flaps can be selected to the UP (0°), TAKEOFF AND APPROACH (15°), LAND (35°) and GROUND FLAPS (55°) positions using the flap select handle. A slight downward pressure is required to move the handle beyond the TAKEOFF AND APPROACH gate to the landing position. The handle must be lifted at the landing gate before it can be moved aft to the GROUND FLAPS (55°) position.

(Continued Next Page)

Figure A12.1: Cessna 525B ground flaps and speed brakes description.

HYDRAULIC SYSTEM (Continued)

The GROUND FLAPS (55°) flap position provides increased aerodynamic drag for landing rollout. After touchdown, with both throttles at idle, the flaps may be selected to GROUND FLAPS (55°). The flap handle must be moved to the full aft stop. As the flaps pass 38° the speed brakes will automatically extend. This 38° switch will shut off hydraulic extend pressure stopping the flaps if the flap handle is not full aft. The 38° switch will illuminate the FLAPS >35 annunciator and MASTER CAUTION if the flaps are beyond 38° and both throttles are advanced beyond approximately 85% N₂, (on the ground), or the right squat switch is not on-ground.

WARNING

The ground flap position is not locked out in flight. Continued safe flight and landing with flaps in ground flaps has been demonstrated. Selection of ground flaps for takeoff or in-flight is prohibited.

The speed brakes are automatically extended with GROUND FLAPS (55°) but may also be extended in-flight or on the ground using the speed brake switch. A white SPD BRK EXTEND annunciator light will illuminate when the speed brakes are fully extended. The speed brakes will be automatically retracted if either throttle is advanced beyond a position corresponding to approximately 85% N₂. Extension of speed brakes will be accompanied by a slight buffet which varies in intensity with airspeed and a slight nosedown pitch.

CAUTION

To preclude high sink rate in the landing flare, the speed brakes must be retracted prior to 50 feet on landing approach.

Figure A12.2: Cessna 525B ground flaps and speed brakes description.

■ HYD PRESS ON (HYDRAULIC PRESSURE ON, SYSTEM REMAINS PRESSURIZED AFTER CYCLE IS COMPLETED)

(Continued)

○ IF SPEED BRAKE CIRCUIT BREAKER NOT PULLED

4. Land as soon as practical. Reset pulled circuit breaker prior to landing.

CAUTION

With high thrust settings, the hydraulic system can operate for approximately 10 minutes before overheating. With low thrust settings, the hydraulic system may be pressurized for up to 30 minutes without overheating.

Procedure completed

● IF HYDRAULIC SYSTEM RETURNS TO NORMAL

Procedure completed

■ ANTISKID INOP (ANTISKID SYSTEM FAILURE)

1. ANTISKID Switch - ON.
2. SKID CONTROL and BRAKE SYSTEM Circuit Breakers (L Panel) - RESET.

● IF LIGHT REMAINS ILLUMINATED

3. ANTISKID Switch - OFF.
4. Landing Distance - Multiply by 1.5.

CAUTION

Differential power braking is available. However, since the antiskid is inoperative, excessive pressure on the brake pedals may cause wheel brakes to lock, resulting in tire blowout.

5. Be prepared to use the emergency brake system.

NOTE

If the antiskid hydraulic pump fails after the accumulator pressure exceeds 900 psi, the POWER BRAKE LOW PRESS light may not illuminate until normal brakes are used.

Procedure completed

● IF LIGHT EXTINGUISHES

Procedure completed

■ PWR BRK LOW PRESS AND ANTISKID INOP (POWER BRAKE SYSTEM FAILURE)

1. SKID CONTROL and BRAKE SYSTEM Circuit Breakers (L Panel) - RESET.

● IF LIGHTS REMAIN ILLUMINATED

2. Plan to use the emergency brake system for landing.
3. Landing Distance - Multiply by 1.7.

(Continued Next Page)

Figure A12.3: Cessna 525B AFM abnormal procedures for antiskid system failure and power brake system failure.

■ PWR BRK LOW PRESS AND ANTISKID INOP (POWER BRAKE SYSTEM FAILURE) (Continued)

4. Brake Pedals - REMOVE FEET FROM BRAKE PEDALS.
5. Emergency Brake Handle - PULL AS REQUIRED.

CAUTION

Antiskid system does not function during emergency braking. Excessive pressure on emergency brake handle can cause both wheel brakes to lock, resulting in blowout of both tires. After landing, clear the runway and stop. Do not attempt to taxi onto ramp using emergency brakes.

NOTE

Best performance can be obtained using a smooth, steady, continuous pull of handle to obtain the desired deceleration rate. Multiple pulls and releases of the handle will deplete the nitrogen charge.

Procedure completed

● IF LIGHT EXTINGUISHES

Procedure completed

■ WHEEL BRAKE FAILURE

1. Brake Pedals - REMOVE FEET FROM BRAKE PEDALS.
2. Emergency Brake Handle - PULL AS REQUIRED.

CAUTION

Antiskid system does not function during emergency braking. Excessive pressure on emergency brake handle can cause both wheel brakes to lock, resulting in blowout of both tires. After landing, clear the runway and stop. Do not attempt to taxi onto ramp using emergency brakes. Landing distance will increase by a factor of 1.7.

NOTE

Best performance can be obtained using a smooth, steady, continuous pull of handle to obtain the desired deceleration rate. Multiple pulls and releases of the handle will deplete the nitrogen charge.

Procedure completed

Figure A12.4: Cessna 525B AFM abnormal procedures for power brake system failure and wheel brake failure.

ANTISKID SYSTEM

The antiskid system provides power assisted braking with skid protection. It is designed to provide maximum braking efficiency on all runway surfaces. The system consists of two wheel speed generators, power brake relay/antiskid valve, control box, oversize reservoir, accumulator and an electrically-driven hydraulic pump.

CAUTION

Do not pull the brake system circuit breaker to prevent the power brake pump from cycling. With the circuit breaker disengaged, the power brake system is inoperative and the rudder pedal toe brakes are disabled. Braking is then available only by use of the pneumatic brake system.

NOTE

If a low brake pressure condition occurs on the ground, the PWR BRK LOW PRESS annunciator will illuminate flashing and the MASTER CAUTION will illuminate steady, but will not cancel when pressed. These visual alerts will continue until the low brake pressure condition is corrected.

System operation is conventional with power braking available at all speeds while antiskid protection is available at speeds above approximately 12 knots. The antiskid protection feature is designed to operate with maximum pilot applied brake pressure. Do not modulate brake pressure when maximum braking is desired.

To ensure proper braking on water, snow and ice-covered, hard-surfaced runways and all unimproved surfaces, it is necessary for the pilot to apply maximum effort to the brake pedals throughout the braking run. When the system detects a skid and releases the applied brake pressure, any attempt by the pilot to modulate braking can result in an interruption of the applied brake signal and may increase stopping distance significantly.

COPILOT'S ELECTRIC ELEVATOR TRIM

An electric elevator trim switch installed on the copilot's control wheel provides the copilot with electric elevator trim. The pilot's electric elevator trim switch, however, has priority and will operate the trim interrupting and overriding actuation of the copilot's switch. Both control wheels contain the trim disconnect function, full time, for the trim runaway condition.

Figure A12.5: Cessna 525B antiskid system description.